

THE FLORA OF THE ELIZABETH ISLANDS,
MASSACHUSETTS

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(Continued from page 132)

HABITATS

Despite their almost uniformly bleak and arid nature, the Elizabeth Islands offer a considerable diversity of habitats and the chief of these, together with a few of the most characteristic plants of each, are here described.

BEACHES. These may be of boulders, cobbles or pure white sand. In the first two cases, few plants may be sought for, although on the shingle or cobble beaches *Ammophila breviligulata* sometimes manages to get a foothold in the loose stones. The sandy beaches, however, offer a habitat for certain characteristic species, of which the following may be noted:

<i>Ammophila breviligulata</i>	<i>Lathyrus maritimus</i>
<i>Triplasis purpurea</i>	<i>Euphorbia polygonifolia</i>
<i>Polygonum glaucum</i>	<i>Convolvulus sepium</i> , var. <i>pubescens</i>
<i>Atriplex patula</i> , var. <i>hastata</i>	<i>Solanum nigrum</i>
<i>Salsola Kali</i>	<i>Solidago sempervirens</i>
<i>Arenaria peploides</i> , var. <i>robusta</i>	<i>Xanthium echinatum</i>
<i>Cakile edentula</i>	<i>Sonchus oleraceus</i>

On some of the beaches dead Eel Grass, *Zostera marina*, has been piled up by the waves, forming dense mats often two or three feet thick.

SALT MARSH. There are no extensive salt marshes on the islands, but a few restricted areas of this nature do occur, such as those along the southwestern shore of Nonamisset, the eastern side of Uncatena, the northeastern end of Naushon facing Lackeys Bay, the regions on the north shore at the west end of the same island, the southeastern corner of Pasque and the extreme west end of Nashawena. Other similar patches, scattered throughout, are too limited or local to merit enumeration. As typical of these low, brackish marshlands, or the slightly elevated peaty areas bordering them, may be cited:

<i>Typha angustifolia</i>	<i>Cyperus ferax</i>
<i>Andropogon glomeratus</i>	<i>C. strigosus</i>
<i>Echinochloa Walteri</i>	<i>Eleocharis parvula</i>
<i>Spartina alterniflora</i> , var. <i>pilosa</i>	<i>E. uniglumis</i> , var. <i>halophila</i>
<i>S. patens</i>	<i>E. rostellata</i>
<i>Distichlis spicata</i>	<i>Scirpus Olneyi</i>

<i>S. validus</i>	<i>Salicornia europaea</i>
<i>S. campestris</i> , var. <i>paludosus</i>	<i>Suaeda linearis</i>
<i>Carex hormathodes</i>	<i>Spergularia leiosperma</i>
<i>Juncus bufonius</i>	<i>Hibiscus Moscheutos</i>
<i>J. Gerardi</i>	<i>Ptilimnium capillaceum</i>
<i>J. articulatus</i> , var. <i>obtusatus</i>	<i>Pluchea camphorata</i>
<i>Rumex maritimus</i> , var. <i>fueginus</i>	

On the brackish mud flats, like those bordering Cuttyhunk Pond, occur such characteristic things as:

<i>Puccinellia pauperula</i> , var. <i>alaskana</i>	<i>Suaeda linearis</i>
<i>Salicornia europaea</i>	<i>Spergularia leiosperma</i>
<i>S. ambigua</i>	<i>Plantago oliganthos</i>

BRACKISH PONDS. Either in the salt marsh areas themselves, or near the shore and separated from the sea only by narrow shingle barriers, occur several brackish ponds, in which may be found such plants as:

<i>Potamogeton bupleuroides</i>	<i>Ruppia maritima</i> , var. <i>subcapitata</i>
<i>P. pectinatus</i>	<i>R. maritima</i> , var. <i>longipes</i>

FRESH WATER PONDS. There are at least 65 fresh water ponds of a more or less permanent nature on the Elizabeth Islands. Of these, some are mere pools 20 or 30 yards across in low hollows or kettle-holes, while others, such as West End Pond on Naushon, may have a width of nearly one-third of a mile. With this wide difference in size there goes a corresponding diversity of pond bottoms and the accompanying floras. Some of the ponds have grassy bottoms and merely represent hollows which have become filled with rain water; others have a sandy or cobbly bottom; while the bottoms of still others are formed of a thick grayish clay. As representative of the plants, floating or submerged, of these fresh water ponds may be mentioned:

<i>Potamogeton Oakesianus</i>	<i>Elatine minima</i>
<i>P. pulcher</i>	<i>Ludvigia palustris</i>
<i>P. diversifolius</i>	<i>Myriophyllum scabratum</i>
<i>Vallisneria americana</i>	<i>M. humile</i>
<i>Glyceria acutiflora</i>	<i>M. tenellum</i>
<i>Lemna minor</i>	<i>Proserpinaca palustris</i>
<i>Nymphozanthos variegatus</i>	<i>Hydrocotyle umbellata</i>
<i>Nymphaea odorata</i>	<i>H. Canbyi</i>
<i>Ranunculus delphinifolius</i>	<i>H. verticillata</i>
<i>Callitriche heterophylla</i>	<i>Nymphoides lacunosum</i>
<i>C. palustris</i>	<i>Utricularia geminiscapa</i>

POND MARGINS. The margins of the fresh water ponds support, in

most cases, a rather characteristic flora, the components of which depend usually upon the nature of the shore.

Around those ponds with a pure sandy border the following plants may be listed as fairly typical:

<i>Cyperus dentatus</i>	<i>Ranunculus Cymbalaria</i>
<i>Scirpus americanus</i>	<i>Potentilla pacifica</i>
<i>Mariscus mariscoides</i>	<i>Samolus floribundus</i>
<i>Juncus pelocarpus</i>	<i>Limosella subulata</i>
<i>J. militaris</i>	<i>Ilysanthes inaequalis</i>
<i>J. marginatus</i>	<i>Coreopsis rosea</i>

Surrounding those ponds, however, which offer a peaty or boggy border, a somewhat different series may be cited as representative:

<i>Thelypteris palustris</i> , var. pubescens	<i>Iris versicolor</i>
<i>Sagittaria latifolia</i>	<i>Habenaria lacera</i>
<i>Sparganium americanum</i>	<i>Drosera rotundifolia</i>
<i>Glyceria obtusa</i>	<i>D. intermedia</i>
<i>G. pallida</i>	<i>Spiraea tomentosa</i>
<i>Eleocharis acicularis</i>	<i>Polygala cruciata</i>
<i>Scirpus cyperinus</i>	<i>Hypericum boreale</i>
<i>Rynchospora alba</i>	<i>H. virginicum</i>
<i>R. capitellata</i>	<i>Viola lanceolata</i>
<i>Carex lurida</i>	<i>Rhexia virginica</i>
<i>Eriocaulon septangulare</i>	<i>Scutellaria epilobiifolia</i>
<i>Xyris caroliniana</i>	<i>Lycopus uniflorus</i>
<i>Juncus canadensis</i>	<i>Gratiola aurea</i>
<i>J. acuminatus</i>	<i>Bidens connata</i>

It is not suggested that the two classes of plants above presented be taken as mutually exclusive. In general, however, these species exhibit a marked preference for the habitat under which they are listed.

SWAMPS. Swampy areas occur near some of the larger ponds, notably west of French Watering Place on Naushon and around portions of the dune ponds on Nashawena. In addition, most of the islands boast one or more swampy hollows and Naushon and Nashawena each has several rather extensive swamps in low-lying depressions near the shore. A few of the characteristic plants of this type of habitat may be noted:

<i>Typha latifolia</i>	<i>Juncus effusus</i> , var. <i>costulatus</i>
<i>Spartina Michauxiana</i>	<i>Spiraea tomentosa</i>
<i>Phragmites communis</i>	<i>Rosa palustris</i>
<i>Dulichium arundinaceum</i>	<i>Impatiens biflora</i>
<i>Scirpus validus</i>	<i>Decodon verticillatus</i>
<i>S. cyperinus</i>	<i>Sium suave</i>

Asclepias incarnata, var. *pulchra*
Lysimachia terrestris

Cephalanthus occidentalis
Eupatorium verticillatum

Bogs. In addition to the restricted boggy areas in the moist hollows and those forming pond margins, there are several rather extensive bogs of a permanent character. Chief among these may be mentioned one chain of bogs at the east end of Pasque and another series at the west end of Cuttyhunk. Many of the plants which occur around the peaty borders of the small ponds grow also in these open bogs, but certain other species reach their fullest development only in the more extensive areas. The following is but a partial list of some of the more conspicuous of these bog plants:

Woodwardia areolata
Thelypteris palustris, var.
 pubescens
Osmunda regalis, var.
 spectabilis
Lycopodium inundatum, var.
 Bigelovii
Panicum longifolium
Glyceria obtusa
Eriophorum virginicum
Rynchospora fusca
Carex cephalantha
C. Howei
C. canescens, var. *disjuncta*
C. virescens
C. limosa
Eriocaulon septangulare
Xyris caroliniana

Juncus effusus, var. *costulatus*
Habenaria clavellata
H. lacera
Pogonia ophioglossoides
Calopogon pulchellus
Drosera rotundifolia
D. intermedia
Rubus hispidus
Polygala cruciata
Viola lanceolata
Epilobium palustre, var. *monticola*
Clethra alnifolia
Rhododendron viscosum
Chamaedaphne calyculata
Vaccinium macrocarpon
Bartonia virginica
Menyanthes trifoliata, var. *minor*

GRASSLAND. As already indicated, the larger part of the surface of the Elizabeth Islands is dominated by open, undulating grassland. The following list, incomplete though it is, will convey more adequately than could any description an impression of the character of these bleak grassy downs:

Dennstaedtia punctilobula
Andropogon scoparius, var.
 frequens
Paspalum pubescens
Panicum virgatum, var. *spissum*
P. depauperatum
P. Lindheimeri, var. *fasciculatum*
P. meridionale
P. oricola
P. sphaerocarpon
Anthoxanthum odoratum

Aristida purpurascens
Phleum pratense
Holcus lanatus
Poa pratensis
Festuca rubra
Agropyron repens
Cyperus filiculmis, var.
 macilentus
Carex albolutescens
C. silicea
C. Muhlenbergii

C. Swanii	Viola fimbriatula
C. varia	Daucus Carota
Juncus tenuis	Trichostema dichotomum
J. Greenei	Linaria canadensis
Sisyrinchium angustifolium	Eupatorium hyssopifolium
Spiranthes gracilis	Chrysopsis falcata
Rumex Acetosella	Solidago suaveolens
Spergularia rubra	S. nemoralis
Stellaria graminea	S. graminifolia
Cerastium vulgatum	S. tenuifolia
Ranunculus acris	Aster patens
Lepidium virginicum	A. linariifolius
Potentilla pumila	Sericocarpus asteroides
P. argentea	Antennaria neglecta
Trifolium arvense	Anaphalis margaritacea
Polygala polygama	Gnaphalium obtusifolium
Euphorbia maculata	Rudbeckia hirta
Hypericum perforatum	Achillea Millefolium
Helianthemum canadense	Chrysanthemum Leucanthemum,
H. dumosum	var. pinnatifidum
H. Bicknellii	Krigia virginica
Hudsonia tomentosa	Leontodon autumnalis
Lechea maritima	Hieracium Gronovii

SCRUB GROWTH. Under the protected lee of the hills, in dry sheltered hollows or bordering the woods, where they form a transition zone between the grassland and the woodland, occur open patches or dense, scrubby thickets of low shrubs, of which the following may be designated as characteristic:

Myrica Gale	Ilex verticillata
M. caroliniensis	Clethra alnifolia
Betula populifolia	Rhododendron viscosum
Pyrus arbutifolia	Leucothoe racemosa
Amelanchier oblongifolia	Lyonia ligustrina
Rubus Andrewsianus	Gaylussacia frondosa
Rosa virginica	G. baccata
Prunus serotina	Vaccinium corymbosum
P. maritima	V. atrococcum
Rhus copallina	Viburnum dentatum

WOODLAND. In certain areas, especially near the center of Naushton, the native woods are made up of almost pure stands of beech, *Fagus grandifolia*. These trees grow nowhere very tall, averaging, perhaps, 30–40 feet, and their low, flat, leafy crowns meet overhead, forming a thick roof through which a subdued light filters. This climax beech forest may also be seen on a somewhat reduced scale in portions of Nonamesset and Nashawena. Usually, however, the wooded areas, although they may be dominated by beech, contain a

liberal sprinkling of certain other species, most prevalent among which are:

Ostrya virginiana	Sassafras officinale
Quercus alba	Acer rubrum
Q. velutina	Nyssa sylvatica
Hamamelis virginiana	

In addition to these important constituents of the densely forested portions, a few other trees occur scattered here and there, seldom entering conspicuously into the formation of the heavy woods. As such may be named:

Pinus rigida	Prunus serotina
Chamaecyparis thyoides	Rhus Vernix
Juniperus virginiana	Ilex opaca
Carya alba	Cornus florida

Mention has already been made of the efforts which were carried on to introduce certain trees either as a windbreak or for ornamental purposes. Some of these, such as white poplar, ailanthus and catalpa, have taken hold and are spreading, while others apparently just manage to survive. A partial list of these introductions follows:

Pinus sylvestris	Betula pubescens
Larix decidua	B. pendula
Picea Abies	Gleditsia triacanthos
P. glauca	Robinia Pseudo-Acacia
P. pungens	Ailanthus glandulosa
Salix alba	Catalpa bignonioides
Populus alba	

The herbaceous flora which enjoys the protection of the native woodland of the islands is for the most part a rather meagre one. The dry, leaf-covered floor of the pure beech woods is almost uniformly sterile, so far as vascular plants are concerned, although such an habitat presents a rich and varied mycological flora, especially following a heavy rain. In the more open mixed woods, however, several characteristic species inhabit the shaded knolls. As examples may be cited:

Pteridium aquilinum, var. latiusculum	Sanicula canadensis
Thelypteris noveboracensis	Monotropa uniflora
Panicum dichotomum	Epifagus virginiana
Carex cephalophora	Galium pilosum

Certain of the low depressions or hollows in the woodland areas are swampy and, in addition to high-bush blueberries (*Vaccinium corymbosum* and *V. atrococcum*), may harbor such plants as:

Sparganium eurycarpum	Juncus effusus, var. solutus
S. americanum	Decodon verticillatus
Sagittaria latifolia	Siam suave
Glyceria striata	Lycopus uniflorus
Carex lupulina	Erechtites hieracifolia

Other similar depressions are moss-covered and boggy and in such situations may be found:

Carex Howei	Oakesia sessilifolia
C. canescens, var. disjuncta	Maianthemum canadense
C. brunnescens, var. sphaerostachya	Medeola virginiana
Arisaema triphyllum	Trientalis borealis

CHANGES IN THE FLORA OF THE ELIZABETH ISLANDS

Here it is proposed to indicate the possible direction and nature of the changes in the flora of these islands. It has seemed advisable to put on record certain facts which illustrate what has already taken place in this respect and to point out others which may be of interest to the future student of the islands in interpreting further changes.

The original wooded nature of all of the Elizabeth Islands has previously been alluded to, as has also the fact that the present treeless condition of some members of the chain is apparently the direct result of cutting by man. Right here the question may very well be asked, "Why have the islands thus denuded never regained their forest growth?" In attempting to solve this problem two chief factors must be taken into account and their relative importance weighed.

In the first place, sheep have been raised more or less extensively on the islands from time to time and the effects of these browsing animals in cropping off the young vegetation must not be lost sight of. Despite the numbers and activities of the sheep, however, they have not succeeded in keeping down completely the herbaceous growth in those areas which they inhabit. Even on Nashawena, where their numbers are greatest, the open grassy downs where they graze boast a large number of species of grasses as well as other plants and one has no difficulty in collecting perfect and unmutilated specimens of any plant which he desires. While evidences of grazing are certainly not absent, the region in general does not present the devastated appearance which so often results where sheep have been allowed to run wild; and the fact that so many herbaceous and shrubby plants are able to make a showing, especially in the protected hollows, would seem to indicate

that it can scarcely have been the sheep alone which kept back the developing growth so severely that the trees were unable to regain their foothold.

The second factor which deserves serious consideration is a geologic one. In an important paper on coastal subsidence in 1893,¹ Dr. Arthur Hollick called attention to the fact, already well established, that the era of elevation which was active along the eastern borders of the North American continent in late Tertiary times resulted in an uplifted coastal plain, the eastern limits of which probably coincided with the present 100-fathom contour (about 100 miles from shore). This elevation is supposed to have reached its maximum shortly after the advent of the Ice Age. Then, either previous to, or subsequent to the period of greatest ice accumulation, an era of depression set in. The rate of subsidence has been roughly calculated and Hollick supposes that 6000 years ago the area included within the present 20-fathom line would have been dry land.

That is, not only would the Elizabeth Islands, together with Long Island, Block Island, Martha's Vineyard and Nantucket, have formed a portion of a continuous land surface, but they would have been some miles inland from the actual coast line. The nearest approach of the 20-fathom line to Cuttyhunk is at a point almost due south, where it is now about 20 miles (32 kilometers) out from the shore. To the southeast this distance increases to about 90 miles (146 kilometers) as the submerged contour swings out to sea to conform roughly to the outlines of Nantucket.

The part which this post-Pleistocene land shelf may have played in the migration of plants to the Elizabeth Islands will be a matter for consideration in the section of the Origin of the Flora which follows. The point requiring present emphasis is this: if all the islands were heavily wooded at a time when perhaps their inland location afforded them some protection, it seems highly probable that later, when they assumed their present position, the severe maritime conditions then prevailing would be such as to discourage nature's attempts at reforestation, once the original woodland were removed. This would suggest that those islands which have never been disturbed, such as Naushon, have merely retained an original forest growth, the possession of which they owe to conditions previously more advantageous

¹ Hollick, A. Plant Distribution as a Factor in the Interpretation of Geological Phenomena, with Special Reference to Long Island and Vicinity. Trans. New York Acad. Sci. xii. 189-202 (1893).

than obtain at present, while those less fortunate have suffered through their comparatively recent exposure to the unmitigated forces of the Atlantic. That excessively high wind velocity is an effective factor in retarding tree growth is nowhere better shown than on the eastern side of Nantucket with its extensive scrub oak barrens. This is further borne out on the Elizabeths by the fact that in the open, unprotected areas scrub growth forms only in the more or less sheltered hollows and the occasional isolated sapling which does get a start elsewhere remains dwarfed and stunted.

It is true that on Martha's Vineyard the woods along certain sections of the north shore have been cut for their timber more than once, and that new growth has been quickly made. But this slope enjoys the protection of the high line of morainal hills, averaging 200–300 feet, which shelter it from the winds of the open sea. No such protection exists on the Elizabeth Islands and the lack of it, rather than the presence of sheep, appears to be the determining factor in the failure of natural reforestation. In the light of these facts, it would seem futile to hope that the devastated areas can ever regain their former wooded luxuriance.

Another phase of vegetational change which it seems worth while putting on record is the behavior of certain introduced species on the Elizabeth Islands.

Reference has already been made to the planting of Scotch Broom, *Cytisus scoparius*, on Naushon. It is interesting to note that, in the account of his reconnaissance made between August 10 and 16, 1898, Dr. Hollick says of this species that it was "planted over extensive areas" on Naushon but that it "did not appear to be in a very thriving condition."¹ Today *Cytisus* occupies solidly an area of many acres along the north shore of the island, near Kettle Cove. On the 10th of August, 1927, Professor Fernald and the writer visited this locality and had the unique experience of wandering through this exotic plantation. The plants grow very close together, and are often 6–8 feet tall, and the tendency in attempting to traverse the area is to lose completely one's sense of direction. Unless checked in some way, *Cytisus* bids fair to encroach even further upon the surrounding region and to usurp in time a much larger area than that which it now dominates. Although introduced also on Pasque and Nashawena, Scotch Broom has nowhere else made the showing that it has upon Naushon.

¹ Hollick, A. Cont. Geol. Dept. Columbia Univ. xi. no. 72. 391 (1901).

Another leguminous plant that has been successful in establishing itself is the Woad-waxen, *Genista tinctoria*. This species was introduced at the extreme east end of Naushon, near Hadley Harbor. It now occupies almost solidly a large field in this vicinity and occurs scattered elsewhere over the open hillsides here as well as on Uncatena.

At several places the Tree of Heaven, *Ailanthus glandulosa*, has become thoroughly naturalized and appears to be spreading rapidly. This is especially true on Naushon, north of Tarpaulin Cove, where, in at least one protected hollow, this tree has formed an extensive and almost impenetrable thicket.

There remains to be considered in this connection such light as is thrown on the nature of vegetational changes by an examination of David Starr Jordan's account of the flora of Penikese as he found it in 1873.¹ The author states it as his hope that his list may have an interest for future botanists, especially "as showing which plants survive a prolonged struggle for existence against grass and sheep." And as this is the first published list of the flora of any of the Elizabeth Islands, it forms our chief basis for a study of those changes which may have occurred over a considerable period of years.

In the paper entitled "The Flora of Penikese, Fifty Years After," which has already been mentioned, Dr. I. F. Lewis summarizes the numerical differences between Jordan's list and that compiled as the result of the survey made in 1923.² It is not intended to duplicate that summary here, but subsequent exploration by the present writer has yielded so many additional records, and a closer scrutiny of the terminology employed in the earlier list has resulted in a so much better understanding of the discrepancies involved, that it seems well to consider, as briefly as possible, just how much significance, if any, attaches to the marked difference in the superficial aspects of the two lists.

The list for 1873, compiled by Dr. Jordan, contains 1 fern and 113 flowering plants, whereas the present list includes 3 ferns, 1 gymnosperm (introduced) and 178 flowering plants. Of the 114 species of vascular plants tabulated by Jordan for Penikese, including Gull Island, a considerable number (about 25) have not been found as the result of recent investigations. On the other hand, of the 182 species of vascular plants on the present list an even larger number (probably 100) were not enumerated in the earlier report.

¹ Jordan. l. c. p. 193.

² Lewis, I. F. RHODORA, xxvi. 188 (1924).

In comparing these two lists the necessary allowances must be made for the very natural changes in nomenclature which have come about during the intervening 55 years. Dr. Jordan states, in a letter to the writer, that the names he employed were those found in the edition of Gray's Manual then most recent (Ed. 5). With this fact in mind, it then becomes possible to reconcile a few of the disparities in the two lists. In general, these discrepancies fall roughly into three categories which may be briefly described as follows:

In the first place, there are those cases in which a difference of names involves direct synonymy. Thus, the plant listed by Jordan as *Dicksonia punctilobula* Kunze is surely the same as that which we are today calling *Dennstaedtia punctilobula* (Michx.) Moore. Similarly, his *Panicum Crusgalli* L. corresponds to our *Echinochloa Crusgalli* (L.) Beauv., his *Triticum repens* L. to our *Agropyron repens* (L.) Beauv., his *Scirpus pungens* Vahl. to our *S. americanus* Pers., his *Maruta Cotula* DC. to our *Anthemis Cotula* L., and so on.

The second class of discrepancies includes cases involving mistaken identity or in which an older species has become recognized as consisting of two or more separate and distinct entities. For example, *Calamagrostis arenaria* Roth of Jordan's list is certainly the plant known today as *Ammophila breviligulata* Fernald. This is not at all a case of direct synonymy, but merely an instance where an American plant, as beautifully pointed out by Fernald, has proved upon study to be entirely distinct from its Old World ally. Again, Jordan's *Spartina stricta* Roth is doubtless our *S. alterniflora* Loisel. var. *pilosa* (Merrill) Fernald, his *Scirpus maritimus* L. our *S. campestris* Britton, var. *paludosus* (A. Nels.) Fernald, his *Sisyrinchium Bermudiana* L. our *S. angustifolium* Mill. *Spergularia salina* Presl, of Jordan's list, appears not to grow on Penikese at the present time, but *S. leiosperma* (Kindb.) F. Schmidt is fairly common and we are presumably warranted in applying a modern interpretation to the older name. Comparable to this are *Cerastium viscosum* L. for which we find only *C. vulgatum* L., *Viola sagittata* Ait., which is represented only by *V. fimbriatula* Sm., *Scutellaria galericulata* L. which is replaced by *S. epilobiifolia* Hamilton, and a host of similar cases. In all such instances, then, we are probably justified in assuming that a plant bearing an unallowable name on the early list is represented today by the name of a recently recognized segregate or a closely related species, rather than that it has actually disappeared from the flora.

Finally, there are several plants on the Jordan list concerning the identity of which, in the complete absence of herbarium material, it is futile even to hazard a guess. *Panicum dichotomum* L., for example, which so far has not been collected, may ultimately be found still growing on the island, or, since that name was applied in a very broad sense in 1873, Dr. Jordan may really have had reference to *P. oricola*, *P. meridionale*, *P. Lindheimeri*, var. *fasciculatum* or to something still different not yet reported from the island. Likewise, *Carex straminea* Schkuhr, a name used loosely before this group had received critical study, may be equivalent to either *C. Longii*, *C. hormathodes* or *C. silicea* or to all three. And again *Polygonum Hydropiper* L., not known from Penikese today, may equal *P. punctatum* Ell., which is ubiquitous, or some other species not yet found. Through the unfortunate lack of preserved vouchers, therefore, all such ambiguous references, when uncorroborated by subsequent collections, must be discredited.

After having made all due allowances, however, for inequalities arising from synonymy, modern revisions and ambiguous records, there still remain slightly more than a score of plants of the 1873 list which recent searches have failed to reveal. Most of these are species which occur on the other islands and their absence from Penikese may be merely an apparent one, to be remedied by further scrutiny. As such may be mentioned: *Poa annua*, *Juncus pelocarpus*, *Atriplex arenaria*, *Salsola Kali*, *Euphorbia polygonifolia*, *E. maculata*, *Hypericum mutilum*, and *Asclepias incarnata*, var. *pulchra*. With the exception of the last two species named, which may have disappeared as the result of gradual drying up of the ponds, there is every reason to expect that these plants will some time be collected on the island. A few others, such as *Ruppia maritima*, *Salicornia europaea* (*S. herbacea*) and *Suaeda maritima*, are plants of brackish situations and their absence is confirmed by independent observations on the tendency of the two saline areas on the island to become overgrown and to lose their brackish character. Even during the six years from 1923 to 1928, South Pond has become distinctly less brackish, both as to the nature of its margin and its algal flora. The same can apparently be said for the ponds on the peninsula, and while these may be merely local and transitory phenomena, they suggest the gradual diminution of brackish areas formerly more extensive, a change worth noting. Three of Jordan's plants which were listed from Gull Island only,

namely, *Rhus Toxicodendron*, *Coelopleurum lucidum* (*Archangelica Gmelini*) and *Limonium carolinianum* (*Statice Limonium*), are not only still missing from Penikese, but have completely disappeared from Gull Island as well. The total absence of Poison Ivy from Penikese, in the face of vigorous and repeated search for it, is one of the queer and not altogether unpleasant surprises of this island. Finally, Jordan lists three plants which are not only unknown from Penikese but, so far, have been collected on none of the other Elizabeth Islands: these are *Puccinellia* (*Glyceria*) *maritima*, *Salix discolor*, and *Iva oraria* (*I. frutescens*). The first of these may well refer to *P. paupercula*, var. *alaskana*, known only from Cuttyhunk, the next might easily have been an introduction which had died out, and *Iva* probably is another of the diminishing salt marsh tribe, a species which it would be interesting to add to the list of Elizabeth Islands plants.

Turning now to the modern list of the flora of the island, we find, after again making the necessary correction for synonymy, errors, etc., that of the 182 species of vascular plants which it includes, at least 96 (53)% can not in any way be identified with anything on the earlier list. This large number of species not seen or listed by Dr. Jordan can conveniently be divided into three groups, as follows: (1) Garden escapes, about 20 species; (2) Cosmopolitan adventives, about 20 species; (3) Native plants, over 50 species.

Garden escapes. This includes a few ornamentals which may well have been planted during the days of the leper occupation, some of which have spread, while others have just barely managed to persist; a few have escaped from the cultivated area near the site of the old laboratory building which was destroyed by fire in 1896. A partial list includes:

<i>Lilium tigrinum</i>	<i>Oenothera grandiflora</i>
<i>Asparagus officinalis</i>	<i>Ligustrum vulgare</i>
<i>Gysophila paniculata</i>	<i>Digitalis purpurea</i>
<i>Dianthus barbatus</i>	<i>Lonicera japonica</i>
<i>Rubus laciniatus</i>	<i>Helianthus annuus</i>
<i>Rosa rugosa</i>	<i>Coreopsis lanceolata</i>

Here also, since this is a class of plants the introduction of which would appear to have been premeditated, should be mentioned a few trees which were set out around the dwelling of the resident physician, namely:

Pinus sylvestris
Salix pentandra
S. alba

Populus alba
Acer Pseudo-Platanus
A. platanoides

Cosmopolitan adventives. These are the ever present European introductions which occur more or less commonly in dry sterile soils and cleared ground, especially near the haunts of man. It is rather surprising that so many plants of this class should be lacking from Jordan's list, but they have probably been brought in with fodder, building materials and other supplies. A few of these may be cited:

Avena sativa
Dactylis glomerata
Bromus secalinus
B. hordeaceus
Carex contigua
Polygonum Convolvulus
Stellaria graminea
Sisymbrium altissimum
Ranunculus acris

Trifolium pratense
Hypericum perforatum
Daucus Carota
Convolvulus arvensis
Linaria vulgaris
Tanacetum vulgare
Sonchus arvensis
S. oleraceus
S. asper

Native plants. As noted above, more than one-half (96 species) of the plants on the present list of the flora of Penikese appear to have reached the island since 1873. Of these 96 species, about 40 have received consideration in the two classes just dealt with; their appearance on the island since 1873 may be accounted for in the light of their being introductions, either accidental or intentional. Permitting of no such simple explanation, however, is the occurrence today on the island of more than 50 species of native plants which were not recorded as present in 1873 by Dr. Jordan. A few of these, such as *Ranunculus delphinifolius*, *Potentilla pumila*, *Callitriche heterophylla* and *Ilysanthes inaequalis*, are rather inconspicuous forms and might conceivably have been overlooked in the preparation of the original report. Others are late-blooming members of the Compositae and, as Jordan lists only one Golden-rod, *Solidago sempervirens*, and not a single Aster, it would seem that he had not remained on the island long enough to obtain a fair sample of the flora of late summer and might thus have completely missed *Solidago juncea*, *S. rugosa*, *S. nemoralis*, *S. canadensis*, *S. tenuifolia*, *Aster undulatus*, *A. multiflorus* and *A. vimineus*, all of which appear on the present list. In this group also, might be placed such things as *Gnaphalium obtusifolium*, *Rudbeckia hirta*, and *Bidens connata*, although these plants are generally recognizable by the first of August, as, indeed, are most of the Goldenrods and Asters listed above. Incapable, however, of any such interpretations as

those just offered, is the present existence on Penikese of the following plants, most of them conspicuous, some of them dominant elements of the vegetation:

Athyrium angustum	Smilax rotundifolia
Thelypteris palustris, var. pubescens	Sisyrinchium graminoides
Typha latifolia	Myrica caroliniensis
Panicum virgatum, var. spissum	Rumex maritimus, var. fueginus
Danthonia spicata	Amelanchier oblongifolia
Distichlis spicata	Rubus pergratus
Scirpus validus	Rosa palustris
Carex hormathodes	Prunus serotina
C. silicea	Rhus typhina
Juncus dichotomus	Parthenocissus quinquefolia
J. Greenei	Oenothera biennis
J. effusus, var. costulatus	Ligusticum scoticum
J. acuminatus	Asclepias syriaca
J. articulatus	Galium Claytoni
	Sambucus canadensis

It is difficult to believe that all these plants could have escaped the attention of the compiler of the original list and we are rather forced to the conclusion that they have made their advent to the island since 1873. By just what means they may have made their way to Penikese and just how much significance may be attached to their occurrence there today, are matters for conjecture. Certainly they are not species preëminently adapted for wind dispersal, although *Typha* and *Asclepias* constitute exceptions to this statement, and spores of the two ferns may possibly have been transported by that agency. A few of them, such as *Scirpus validus*, *Juncus acuminatus*, *J. articulatus* and the *Rumex*, which grow in or around ponds, may have been brought in by birds, while a few others have fleshy seeds or fruits and may also have been introduced in this way. On the other hand, the presence of this large block of recent arrivals may be merely illustrative of what takes place on these islands when the practice of raising sheep is discontinued, although it is difficult at first sight to see just why these particular species should have been kept down until recent times when so many others were not only present in 1873 but have survived the "prolonged struggle for existence against grass and sheep."

(To be continued)

THE CAPE COD CEANOTHUS.—In the sandy open woods of "Middle" Cape Cod (from eastern Barnstable to Harwich and Brewster), where the characteristic flora is that of the southern Coastal Plain, the New